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PSYCHOLOGY.

Subjective Defense in the Lower Animals.—In this paper I use the word "defense" in its broadest sense, not only as the antethesis of offence, but in the sense of protection. The instinct of defense or self protection is greatly developed in the lower animals, so much so, that the observant naturalist finds evidence of it even in microscopic organisms.

On one occasion I opened the burrow of an itch insect (*Acarus*), and allowed the serum to float out the little parasite which dwelt therein. I could, with the assistance of a good French lens (X 15 diameters) closely see it moving along on the surface of the skin. I touched it with the point of a needle, and at once it stopped all motion and feigned death. In a few moments the little animal regained its feet and slowly moved off, only to again feign death as soon I touched it with the needle. This habit of letusimulation (*letum*, death, and *simulare*, to feign), I have noticed in much lower animals, and am convinced that they make use of this strategy for the purpose of self-protection.

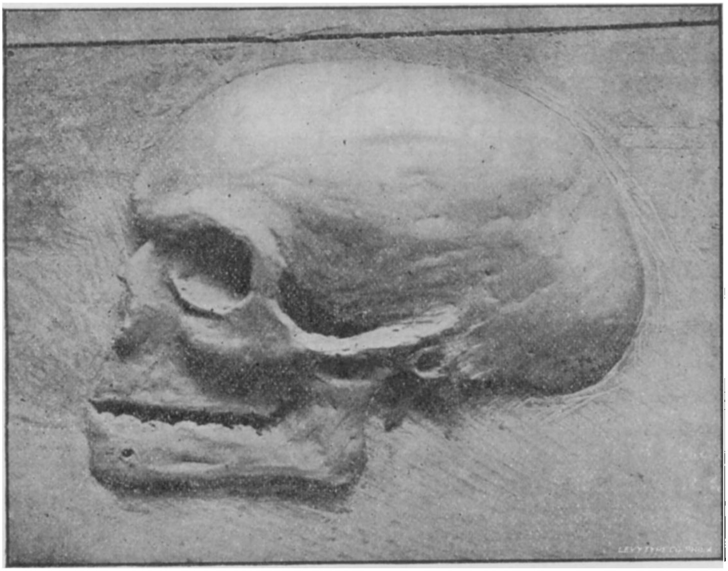
A minute fresh water animacule (rhizopod) retracts its hair-like feet, feigns death and sinks, whenever its enemy, a water louse, approaches it. I have witnessed this occurrence on several occasions, and have, likewise, seen Rhizopoda return to their feeding-grounds as soon as their enemy has disappeared. A fresh-water worm practices letusimulation when approached by the giant water-beetle, and many of the microscopic infusory animalcules likewise make use of the same sagacious subterfuge when surprised by their enemies. Death-feigning is practiced by most of the slow-moving beetles, especially is this noticeable in the tumble-bug and bombardier-beetle. This last-mentioned insect, notwithstanding its disgusting odor, is the favorite food of some of the birds, noticeably, the jay and the cardinal. They will not touch it if killed and offered to them; numerous experiments have taught me that these birds regard it as unsuitable food unless taken alive. There is, probably, some *post-mortem* change in the juices of the beetle, which renders it unpalatable. The object of letusimulation in this beetle is made perfectly obvious. In a paper on "Animal Letusimulants," published in the March number of *Atlantic Monthly,* I account for the origin of death-feigning in animals, as follows: "Most animals are slain for food by other animals; there is a continual struggle for existence. Most of the carnivora and insectivora prefer freshly killed food to carrion. It is a mistake to suppose that carnivora prefer carrion, though the exegencies of their lives in their struggle for existence often compels them to eat it. Dogs will occasionally take it, but sparingly, and apparently as a relish, just as we ourselves eat certain odoriferous cheeses. Carnivora and insectivora would rather do their own butchery; hence, when they come upon their prey seemingly dead, they will leave it alone and go in search of other quarry, unless they are very hungry. Tainted flesh is a dangerous substance to go into most stomachs, certain ptomaines rendering it, at times, virulently poisonous. Long years of experience have taught this fact to animals, therefore, most of them let dead or seemingly dead creatures severely alone."

The larvæ of many of the moths and butterflies are pronounced letusimulants. In fact, I may say that all edible larvæ practice this cunning trick. Take a caterpillar in the fingers, or touch it with a stick, and it will at once curl up and feign death. They invariably assume that shape which *rigor mortis* occasions in real death. Mr. George D. Mattingly, of Owensboro, Ky., related to me the following instance of letusimulation in a caterpillar: This larva had fallen accidently into a conical depression in a sand-heap. It attempted to crawl up the north side of the pit, but, owing to the rolling of the sand beneath its feet, slipped back. It then tried the west side, and almost reached the top. Here, however, it dislodged a lump of agglutinated sand-grains, and rolled, together with the lump, to the bottom of the hole. The caterpillar, imagining the clod of sand to be an enemy, at once curled up and feigned death. It remained quiescent for several minutes, then tried the south side, mounted safely to the top, and went on its way rejoicing. The fact that this larva tried three different routes before reaching the top, shows a high degree of conscious determination. Many of the thousand-legs have this habit, and practice it whenever the occasion demands. The toad is a gifted letusimulant; when it sees that it cannot escape its enemy, it ducks its head, draws in its legs close to its body, and feigns death. It may be turned upon its back, or thrown to some little distance, or handled freely, yet it will give no sign of life, unless pain be inflicted.

Some of the snakes have acquired this habit, notably the moccasin (*Ancistrodon*). Last August I discovered a moccasin in an open field where there were no sheltering rocks, bushes, weeds, etc. I teased it for quite a while with my stick, driving it back whenever it attempted to escape. Suddenly it bent its body backwards and seemingly inflicted a severe bite on its own back. Immediately it turned over on its back, belly upwards, to all appearances dead. I retired some little distance and seated myself on the ground. After five or six minutes the snake turned upon its belly and glided rapidly away.

Mr. John Cheatham, of Owensboro, Ky., informs me that on September 23, he and Mr. John Harrison came suddenly upon a black or blowing-viper in a field. Mr. Harrison remarked that he could make the snake commit suicide; whereupon, he picked up a long stick and began to annoy it, driving it back whenever it endeavored to escape. In a few moments "the snake bent back and drew his widely open mouth violently along his body as if endeavoring to rip himself open. He then turned upon his back and died at once." This act of letusimulation was so perfect that Mr. Cheatham and friend walked away, thoroughly convinced that they had seen a suicide enacted. It is hardly necessary to remark that the snake in question is perfectly harmless, having neither fangs nor poison glands. Many of the higher animals make use of the simulation in order to deceive their enemies or their prey.

The Criminal Skull.—I give a figure of a model in clay of the skull of Jeff. Diggs who died at the age of fifty, having passed, according to his own statement, thirty years of his life in reformatories, workhouses, jails and penetentaries. This model is made to scale and is



The Criminal Skull.

exact in every particular. A Photograph of the original skull does not bring out the detail, hence I made the model in clay. It should have accompanied the text of "The Recidivist," American Naturalist, June, 1894, but an injury to my right hand prevented a completion of the model in time.

POINTS TO BE NOTED.

1. Flattening of the cranial arch.
2. Shallowness of brain-pan.
3. Dolichocephalism.
4. Prognathism.
5. Enlargement of orbital arches.
6. Smallness of orbicular cavities.
7. Highness of cheek bones.
8. Bowing of zygoma.
9. Sagging of occiput.
10. Heaviness and projection of lower jaw.
11. General asymetry of skull.
12. Resemblance to the prehistoric skull of the Man of Spy.

See "The Recidivist" American Naturalist, June, 1894.

JAS. WEIR, JR., M. D.

The Habits of Amblystoma opacum.—I once secured a number of marbled salamanders (*Amblystoma opacum*), and kept themin a small enclosure where they lived under chunks of wood. They did not curl up as they are said to do, but lay stretched out, showing but little sign of life. Their food was larvæ and earthworms; I believe they will not eat flies nor ants. They are so soft, weak and helpless, that I thought that they could not dig deeper than merely sufficiently to hide themselves, but, out of deference to the opinion of Mr. Nicholas Pike, who says that they will burrow to a depth of three feet, I sunk a board two feet deep around their enclosure. I was absent for a time, and returned to find my salamanders missing. On digging carefully, I found unmistakable signs of their burrows extending beneath the sunk board. They had burrowed out and escaped, corroborating two feet of Mr. Pike's story.—ANGUS GAINES.

Habits of Ophibolus getulus.—Early in July I captured an *Ophibolus getulus*, a small but very fine specimen, answering perfectly to the description of the type given by Dr. O. P. Hay, in the Seventeenth Annual Report of the Indiana Geologist.

The little reptile fought fiercely when first picked up, but was perfectly docile the next day. I kept him in an enclosure with a number of other snakes of various species, but he appeared to dislike their society and appeared reluctant to share their bed of loose cotton. He refused all food and took no notice of the earthworms, insects, minnows and small frogs and toads with which my other snakes were fed, and paid no attention to a *Natrix sipedon* much smaller than himself When placed in a box with a large number of small toads, he appeared frightened and tried to escape. Acting upon a suggestion offered by Professor Cope in his article on "Critical Review of the Characters and Variations of the Snakes of North America," I kept him supplied with a saucer of milk, of which he took no notice.

After he had been in my possession for 25 days, I captured a *Eutænia radix* which I put in the same enclosure. The other snakes paid no attention to the newcomer, but the *Ophibolus* roused at once, as if scenting a natural enemy, and seized the *Eutænia*. The fight was long and fierce, for the *Eutænia* was strong and active, and was five inches longer than his assailant, but the *Ophibolus* gained the victory and undertook the seemingly impossible feat of swallowing his victim. This task occupied the whole night, but he actually succeeded in swallowing the snake five inches longer than himself. This very hearty meal distorted him beyond recognition, and he gave no signs of life except by a slight twitching of the tail. After an absence of some 40 hours I revisited my terrarium, and found that he had disgorged his prey and resumed his proper shape.

Since that time the *Ophibolus* has taken no food, though he is still strong and active; his spots, however, which were originally of ivory whiteness, have assumed a sulphur yellow hue.

I tried placing a looking-glass in my terrarium, and the *Ophibolus* showed signs of excitement at the first sight of his reflection, but afterwards paid no attention to it.

My *Ophibolus getulus*, 12½ inches long, after going fifty days without food, except the one snake which it subsequently disgorged, killed and ate a *Natrix sipedon* over eight inches long, and is doing well.

—ANGUS GAINES.